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ABSTRACT

A computer-assisted instruction (CAI) laboratory provides deaf students at Kendall School in Washington, D.C. with drill and practice exercises in mathematics. The Stanford-developed curriculum offers two basic math options--fixed and mixed strand. During the first full year of operation, CAI math was offered to 111 students, ages 8-15. Stanford Achievement Test (SAT) results were used to check the achievement gains of students using the program. Twenty out of 28 lower elementary students achieved at least one grade level in math; eight achieved two years. Fifteen out of 33 upper elementary students demonstrated a one grade increase; eight out of 23 middle school students increased one grade or more. The lower achievement gains for middle school students were attributed to the fact that most of them remained in mixed strand programs for most of the year and that their SAT level test scores may have been less valid. (KB)

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COMPUTER-ASSISTED INSTRUCTION

AT

KENDALL DEMONSTRATION ELEMENTARY SCHOOL

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U.S. DEPARTMENT OF HEALTH, EDUCATION & WELFARE
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The purpose of today's presentation is to share with the profession the present status of computer-assisted instruction (CAI) at the Kendall Demonstration Elementary School in Washington, D.C. Some of you are aware that Kendall School was one of the pioneers in the CAI field when the program was incepted during the 1968-69 school year as a part of the federally-funded project based at Stanford University. The project expired three years ago when the funding was phased out. Some programs were purchased by the Kendall School and Model Secondary School for the Deaf and were programmed into the DPD-10 computer at Gallaudet College. Instruction was resumed a year and a half ago.

The system at Kendall School is composed of 12 hard-copy Model 33 KSR TTYs. The curriculum in both mathematics strands and language arts, which were developed at Stanford, are the main offerings. Various simulations and games are available from the Gallaudet Computer Center library. The TTY terminals are centrally located in a CAI lab. The schedule varies, but basically each student has a 20-minute period twice a week for drill-and-practice exercises. The lab is monitored by a CAI aide who keeps track of the students' progress and prescribes drills at appropriate levels in coordination with their teachers.

The past academic year was the first full year in operation and today's report will be based on the data collected at the end of the school

year. An attempt will be made to review the students' growth during the year.

For those not familiar with the Stanford mathematics curriculum, it is designed so that two basic options are offered. In fixed strand a student might be assigned to one of the 14 available strands, each one emphasizing a particular mathematics operation such as vertical addition, horizontal addition, multiplication, etc. The mixed strands option presents different operations in random order at a certain grade level for the student to solve.

As it can be seen from the table on the following page the mathematics curriculum is offered at grades 1.0 through 7.9 and not all strands are available at all grade levels. For example, Horizontal Addition is available from grade 1.0 through 3.9. Exercises in Fractions are offered from grades 3.5 through 7.9.

Collection of Data

The data collected for today's presentation will be in raw form. CAI in mathematics was offered to 111 students, aged 8 through 15. To facilitate the presentation, reporting of data will be by three groupings of students from the lower elementary department through the middle school. Data of 17 students in the primary department are excluded from the report.

The data from 29 students in the lower elementary level [illegible] years old) shows a range of .1 to 1.4 grade increase (one month to one [illegible] four months) during the year as measured by the CAI program. Twenty-one out of 29 students showed at least one grade gain in the Vertical Addition strand. Similar gains in Horizontal Addition were attained by five students and Vertical Subtraction by three students.

TABLE 1

Mathematics Strands

Strand Number	Abbreviation	Name	Grade-level First Class	Grade-level Last Class
1	NUM	Number concepts	1.0	7.9
2	HAD	Horizontal addition	1.0	3.9
3	HSU	Horizontal subtraction	1.0	3.4
4	VAD	Vertical addition	1.0	5.9
5	VSU	Vertical subtraction	1.5	5.9
6	EQN	Equations	1.5	7.9
7	MEA	Measurement	1.5	7.9
8	HMU	Horizontal multiplication	2.5	5.4
9	LAW	Laws of arithmetic	3.0	7.9
10	VMU	Vertical multiplication	3.5	7.9
11	DIV	Division	3.5	7.9
12	FRA	Fractions	3.5	7.9
13	DEC	Decimals	4.0	7.9
14	NEG	Negative numbers	6.0	7.9

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Stanford Achievement Test (SAT) results seem to indicate that 20 out of the 28 students achieved at least one grade level in mathematics and eight of them achieved at least two years.

Thirty-three students (age 11-12) in the upper elementary level participated in the mathematics strands. Nineteen students demonstrated at least one grade increase, with a range from .3 grade to 4.8 grades. Data further shows that 23 attained at least one grade in Vertical Addition; 15 in Vertical Subtraction; two each in Horizontal Addition and Decimals. It must be pointed out that not every child had all strands; for example the Decimals strand was available to only nine students.

SAT data of 20 of the upper-elementary students was available for comparison. Fifteen of them gained at least one grade; 12 of them between 1.5 and 2.0 grades.

CAI data of 31 students in the Middle School indicated that ten of them increased one grade or higher in overall performance with a range from .1 to 1.7 grades. Ten students showed an increase of at least one grade in Vertical Addition, six each in Vertical Subtraction and Vertical Multiplication. Four others attained at least one grade each in Measurement, Laws of Arithematic, Division, and Fractions. SAT scores of 23 students that are available for comparison show that eight attained at least one grade increase in performance.

Conclusions and Discussions

Comparing the students' achievement as measured by the CAI's standards with the SAT scores might be analogous to comparing cows with horses. Thus, for further discussion the SAT scores in mathematics will provide realistic examples of students' growth.

A total of 35 out of 48 students (73 percent) in both the elementary groupings achieved at least one year in mathematics. It is estimated that the performance of at least 50 percent of these 48 students improved at least one and a half grades in one year. On the basis of the positive growth it is believed that CAI as supplementary instructional medium is instrumental in accelerated student performance in mathematics.

Two factors can be attributed to the lower performance of the students in the middle school. Most of them remained in the "mixed strands" for most of the year, thus it seems that their potential growth was retarded. Another possible factor is that most of the students took different battery level SATs during the period, and by taking a higher level it might have affected their recent scores.

Not all students take to CAI like ducks to water, but the raw data suggests that a great number of students do make greater gains as a result of the drill-and-practice exercises. It might be added that the CAI releases teachers from preparing tedious worksheets and makes it possible for the teachers to work with the students on an individual basis.

Planning for Future

At this time I would like to share with you our plans for the near future. KDES will be moving to two temporary facilities this coming winter, and plans are being made to decentralize the CAI lab. There will be three clusters of terminals, each cluster accessible to a major part of the users. Thus, it will offer greater flexibility as the teachers will not be dictated by the location and schedule of the CAI and take a more active part in individualizing instruction of the students.

We have recently expanded our library by purchasing eight CAI programs appropriate for our younger students from the Dartmouth Time Sharing System Library. However, it is evident that (1) there is a lack of CAI materials suitable for elementary-grade deaf students, and (2) developments in CAI has somewhat slowed down in favor of industry. Thus, it is planned that KDES will take an active part in designing and developing additional CAI materials for the school and profession.